



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

10/525,549

10/24/2005

John P. Wikswo

14506-48682

6053

24728 7590 10/27/2009  
MORRIS MANNING MARTIN LLP  
3343 PEACHTREE ROAD, NE  
1600 ATLANTA FINANCIAL CENTER  
ATLANTA, GA 30326

EXAMINER

BOWERS, NATHAN ANDREW

ART UNIT

PAPER NUMBER

1797

NOTIFICATION DATE

DELIVERY MODE

10/27/2009

ELECTRONIC

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

ipdocket@mmmlaw.com  
jxs@mmmlaw.com  
pwang@mmmlaw.com

<b>Office Action Summary</b>	<b>Application No.</b> 10/525,549	<b>Applicant(s)</b> WIKSWO ET AL.	
	<b>Examiner</b> NATHAN A. BOWERS	<b>Art Unit</b> 1797	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 17 June 2009.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-16, 19-48 and 50-65 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-16, 19-48 and 50-65 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                     | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Priority***

The disclosure of the prior-filed application, Application No. 60/406278, fails to provide adequate support or enablement in the manner provided by the first paragraph of 35 U.S.C. 112 for one or more claims of this application. Application No. 60/406278 does not describe the use of a means positioned on a third substrate and adapted for electrochemical measurements of cells responsive to a liquid medium.

Accordingly, claims requiring this limitation are not awarded the priority date established by Application No. 60/406278.

### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1, 33 and 60 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

It is unclear whether Applicant intends for the claim limitations “means positioned in the third substrate and adapted for electrochemical measurements” and “means adapted for electrochemical measurements” to invoke 35 U.S.C. 112, sixth paragraph. If applicant wishes to have this claim limitation treated under 35 U.S.C. 112, sixth paragraph, Applicant is required to:

- (a) Amend the claim to include the phrase “means for” in accordance with

Art Unit: 1797

these guidelines: the phrase "means for" must be modified by functional language and the phrase must not be modified by sufficient structure, material, or acts for performing the claimed function; or

- (b) Show that the claim limitation is written as a function to be performed and the claim does not recite sufficient structure, material, or acts for performing the claimed function which would preclude application of 35 U.S.C. 112, sixth paragraph. For more information, see MPEP 2181.

If claim elements "means positioned in the third substrate and adapted for electrochemical measurements" and "means adapted for electrochemical measurements" are determined to be a means plus function limitations that invoke 35 U.S.C. 112, sixth paragraph, then it is understood that the written description does disclose the corresponding structure, material, or acts for the claimed function.

Paragraph [0028] of Applicant's specification states that electrodes are used to measure the electrochemical properties of cells.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

- (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

1) Claims 1-5, 8-16, 19-22, 33-38, 41-48 and 50-65 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kanegasaki (US 20030003571) in view of Lynes (US 20020086280).

With respect to claim 1, 15, 16, 19-22, 33, 45-48, 50-52 and 57-65, Kanegasaki discloses a bioreactor for cultivating cells in a liquid medium comprising a first substrate (Figure 5:7) having first and second surfaces defining a chamber therebetween. A barrier comprising a channel (Figure 5:1) and a plurality of protrusions (Figure 5:6)

Art Unit: 1797

serve to divide the chamber into a first subchamber (Figure 5:2A) and a second subchamber (Figure 5:2B). This is disclosed in paragraphs [0084], [0085] and [0095]. Paragraph [0097] states that the protrusions and grooves formed within the channels are varied in order to control the diffusion of a particular cell type between the subchambers. Paragraph [0121] states that the gaps of the barrier range from 3 to 50 microns. Figure 12 and paragraph [0112] describe another configuration in which first and second barriers (1) are positioned so as to form a central chamber (2A), an intermediate chamber (2B), and an outer chamber (2C). Furthermore, Kanegasaki indicates that a second substrate (Figure 6:9) is positioned adjacent to a first surface of the first substrate (Figure 6:7), and that a third substrate (Figure 6:8) is provided in communication with a second surface of the first substrate (Figure 6:7). Kanegasaki, however, does not expressly disclose that the third substrate includes a means for electrochemical measurements.

Lynes discloses a substrate (Figure 1:58) designed to monitor cell movement in response to chemotactic factors. Paragraphs [0018] and [0019] indicate that a plurality of individually addressable working electrodes (Figure 1:10) and counter electrodes are arrayed upon the substrate so as to measure changes in impedance, resistance or capacitance that result from the motion of cells (Figure 1:54). Lynes further describes the use of at least one reference electrode. Figure 2 indicates that a plurality of edge connector pads and electrically conductive leads are in communication with each electrode. The effect of a certain analyte is determined by monitoring cell behavior upon the introduction of the analyte into the culture solution.

Art Unit: 1797

Kanegasaki and Lynes are analogous art because they are from the same field of endeavor regarding cell migration detection systems.

At the time of the invention, it would have been obvious to provide a third substrate in the system of Kanegasaki with a plurality of electrode capable of detecting cell movement. This would allow for a second means to determine cell behavior in addition to simple visual observation. Generally speaking, automated detection using impedance measurements is often times superior to visual observation, which is difficult and laborious. Paragraph [0017] of Lynes teaches that electrical detection using a patterned array of electrodes offers a rapid, automated and multiplexed analysis of cell movement and factors capable of affecting such movement.

With respect to claims 2 and 34, Kanegasaki and Lynes disclose the bioreactor set forth in claims 1 and 33. As noted above, the barriers located between the first and second subchambers are adapted for allowing the perfusion of certain cell types while restricting the movement of certain cell types.

With respect to claims 3-5 and 35-38, Kanegasaki and Lynes disclose the bioreactor set forth in claims 2 and 33. The Kanegasaki bioreactor is considered to be fully capable of accommodating any type of microorganism including bacteria, protozoa, tumor cells, endothelial cells, and normal tissue cells.

With respect to claims 8 and 9, Kanegasaki and Lynes disclose the bioreactor set forth in claim 1. Additionally, Kanegasaki teaches that an input port (Figure 3:3Aa) and an input transfer channel are formed in the substrate and provided in fluid communication with the first subchamber. Furthermore, an outlet port (Figure 3:3Ba) and an outlet transfer channel are provided in communication with the second subchamber.

With respect to claims 10 and 11, Kanegasaki and Lynes disclose the bioreactor set forth in claim 9 wherein at least one auxiliary port and channel are provided in fluid communication with the input and outlet ports. Kanegasaki teaches that additional ports (Figure 3:4Ba and Figure 3:4Aa) are used in conjunction with inlet (Figure 3:3Aa) and outlet (Figure 3:3Ba) ports, so as to supply extra reagents to the subchambers.

With respect to claims 12 and 13, Kanegasaki and Lynes disclose the bioreactor set forth in claim 11. As previously noted above, Kanegasaki indicates that a second substrate (Figure 6:9) is positioned adjacent to a first surface of the first substrate (Figure 6:7). The second substrate comprises a plurality of connection channels (Figure 6:3A, 4A, 4B, 3B) that are aligned with the inlet/outlet ports of the first substrate.

With respect to claims 14 and 44, Kanegasaki and Lynes disclose the bioreactor set forth in claims 1 and 33 wherein the first substrate is formed from silicon. This is described in paragraph [0154] of Kanegasaki.



With respect to claims 23 and 24, Kanegasaki and Lynes disclose the apparatus set forth in claim 17. Kanegasaki additionally describes the use of silicon substrates in paragraph [0154].

With respect to claims 41-43, Kanegasaki and Lynes disclose the bioreactor set forth in claim 33. Kanegasaki further indicates that inlet and outlet ports (Figure 12:3a, 4a) are provided for each of the external, central, and intermediate chambers.

With respect to claims 53-56, Kanegasaki and Lynes disclose the apparatus set forth in claim 52. The plurality of electrodes disclosed by Lynes are fully capable of being subdivided into any number of subgroups. The creation of second and third electrode groups would not require any change in the structure of the device, but would merely require a change in the experiment protocol. Altering the controller program does not result in a structurally significant limitation in an apparatus claim, but rather represents an intended use.

2) Claims 25-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kanegasaki (US 20030003571) and Lynes (US 20020086280) as applied to claim 1, and further in view of Allen (US 20040142409).

Kanegasaki and Lynes disclose the apparatus set forth in claim 1 as set forth in the 35 U.S.C. 103 rejection above. Although Kanegasaki discloses in paragraphs [0163]-[0165] an optical system for the interrogation of motile cells, Kanegasaki does

Art Unit: 1797

not indicate that the optical sensors and light sources are provided on a substrate above the first substrate.

Allen discloses a detection system for monitoring the movement and presence of a cell (Figure 1:56) in a solution. An upper substrate (Figure 1:25) is provided above the base substrate (Figure 1:10), and serves to house a light source (Figure 1:30) and a photodetector (Figure 1:40). This is described in paragraphs [0033]-[0035].

Kanegasaki and Allen are analogous art because they are from the same field of endeavor regarding optical means for monitoring cell movement in a microfluidic system.

At the time of the invention, it would have been obvious to provide the Kanegasaki device with an additional substrate capable of holding a plurality of optical sensors, LED light sources and other optical detection means well known in the art. By arranging all critical optical components on an independent substrate, the overall apparatus would be characterized by a modular construction that would allow one to add and remove the optical devices with greater ease. As evidenced by Allen, it is well known in the art to form important detection means integral with a substrate formed above a culture chamber.

3) Claims 6, 7, 39 and 40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kanegasaki (US 20030003571) and Lynes (US 20020086280) as applied to claims 1 and 33, and further in view of Thomas (US 20060194273).

Kanegasaki and Lynes disclose the apparatus set forth in claim 33 as set forth in the 35 U.S.C. 103 rejection above, however do not expressly disclose the use of cell adhesion coatings.

Thomas discloses the bioreactor as previously described above. In paragraphs [0040] and [0042], Thomas teaches that biocompatible coatings are applied to the surfaces of the cell chamber in order to promote cell adhesion.

Kanegasaki and Thomas are analogous art because they are from the same field of endeavor regarding microfluidic bioreactors.

At the time of the invention, it would have been obvious to utilize the adhesion promoting coatings disclosed by Thomas in the apparatus set forth by Kanegasaki. In paragraph [0160], Kanegasaki teaches that materials that encourage cell adhesion to substrate surfaces are beneficial. One of ordinary skill in the art would have recognized that the application of a coating to the substrate of Kanegasaki would have required only minor structural alterations, and would be completed in a predictable manner while yielding predictable results.

#### ***Terminal Disclaimer***

The terminal disclaimers filed on 17 June 2009 disclaiming the terminal portion of any patent granted on this application which would extend beyond the expiration date of U.S. Application No. 10/525,538 and U.S. Patent No. 7,534,601 has been reviewed and is accepted. The terminal disclaimers have been recorded.

***Response to Arguments***

Applicant's arguments filed 17 June 2009 with respect to the prior-filed provisional application 60/406,278 are persuasive. It is agreed that lines 5-29 of page 28 and Figure 1 of Appendix A disclose a barrier that divides a chamber in two (or more) chambers.

However, due to Applicant's most recent amendment, each independent claim now also requires a means adapted for electrochemical measurements of cells. A teaching of this newly added limitation in provisional application 60/406,278 cannot be found.

Applicant's arguments filed 17 June 2009 with respect to the 35 U.S.C. 102 rejections involving Thomas have been fully considered and are persuasive. These rejections have been withdrawn.

Applicant's arguments filed 17 June 2009 with respect to the 35 U.S.C. 102 rejections involving Kanegasaki have been fully considered and are persuasive. Therefore, these rejections have been withdrawn. However, upon further consideration, a new ground of rejection is made in view of the combination of Kanegasaki and Lynes.

The Lynes reference addresses the deficiencies of Kanegasaki by indicating that it is known in the art to provide electrodes to precisely and automatically measure chemotaxis.

***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to NATHAN A. BOWERS whose telephone number is (571)272-8613. The examiner can normally be reached on Monday-Friday 7 AM to 4 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Marcheschi can be reached on (571) 272-1374. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 1797

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/William H. Beisner/  
Primary Examiner, Art Unit 1797

/Nathan A Bowers/  
Examiner, Art Unit 1797